

U.S. FISH AND WILDLIFE SERVICE

HATCHIE

NATIONAL WILDLIFE REFUGE

TENNESSEE

BIG LAKE DAM
INSPECTION REPORT



JUNE 1984




INSPECTED: SEPTEMBER 1983

BIG LAKE DAM
ON A TRIBUTARY OF HATCHIE CREEK
A TRIBUTARY OF THE MISSISSIPPI RIVER
HAYWOOD COUNTY
TENNESSEE

FEDERAL INVENTORY NUMBER TN 07505

INSPECTION AND REPORT BY


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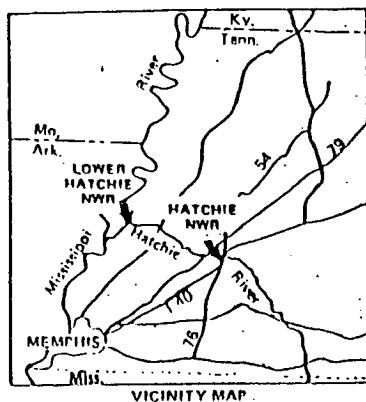
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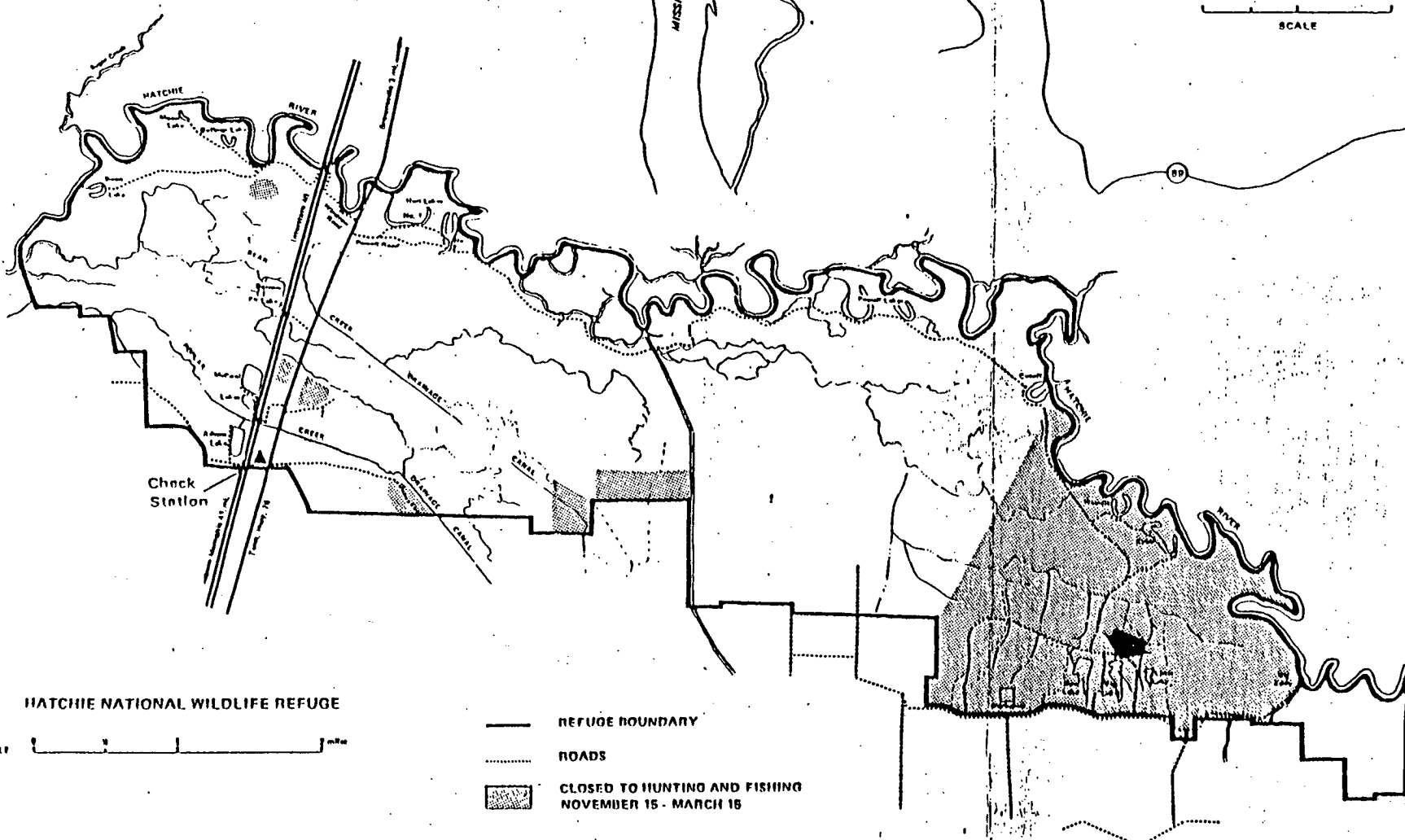
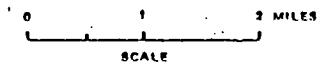
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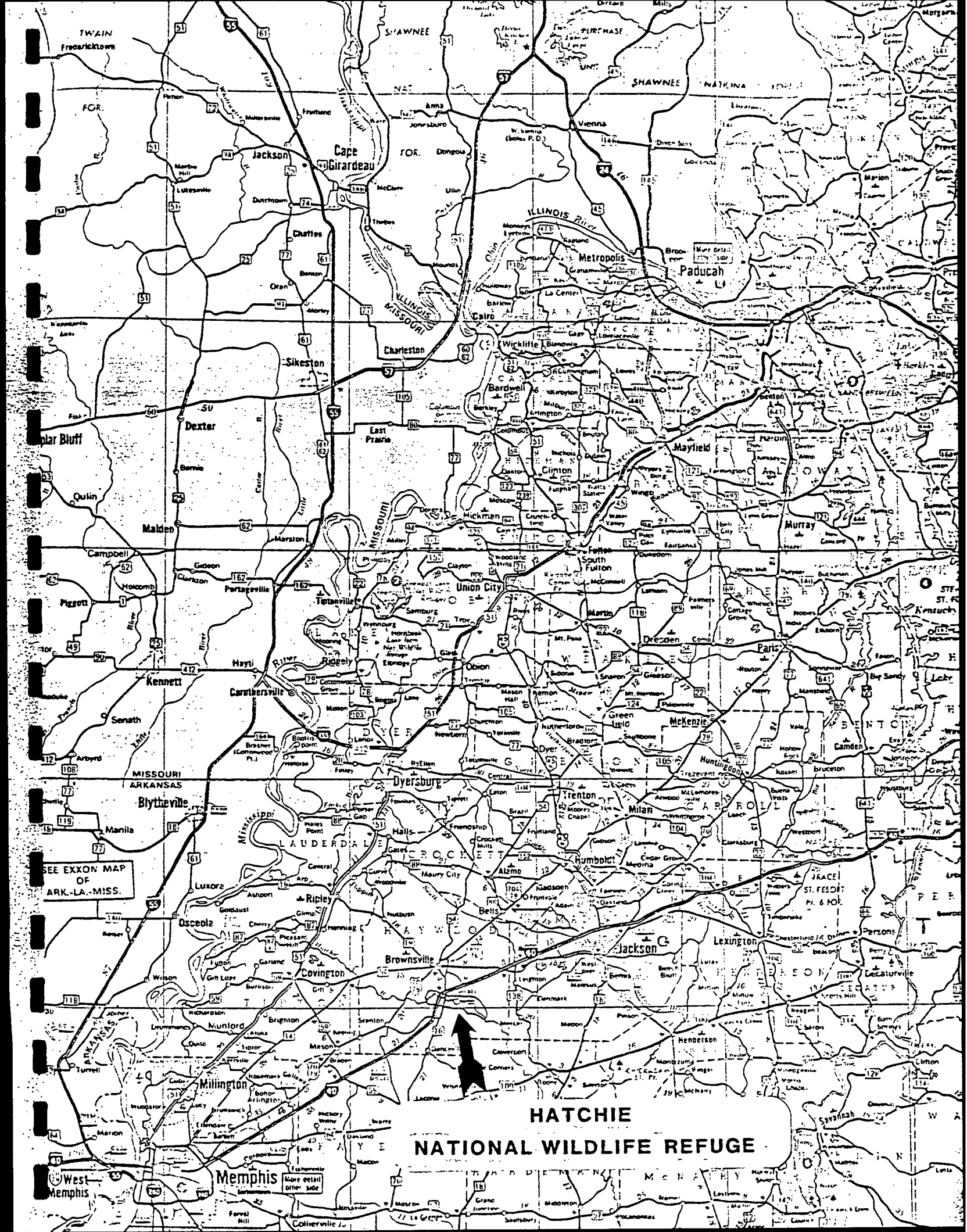
LOWER HATCHIE NATIONAL WILDLIFE REFUGE



HATCHIE NATIONAL WILDLIFE REFUGE



NATIONAL WILDLIFE REFUGE
HATCHIE
LOCATION MAP



**HATCHIE
NATIONAL WILDLIFE REFUGE**

SEE EXXON MAP
OF
ARK.-LA.-MISS.

PERTINENT DATA

A. GENERAL

Name of Dam	BIG LAKE DAM
State	TENNESSEE
County	HAYWOOD
Federal Inventory Number	TN 07505
Hazard Potential Classification	3 (LOW)
Owner	U.S. Fish and Wildlife Service
Legal Description	LATITUDE 35° 28'
	LONGITUDE 89° 11'

B. EMBANKMENT

Type	HOMOGENEOUS EARTHFILL
Crest Length	1000 feet
Crest Width	16 feet
Crest Elevation	334.5 *
Structural Height	19 feet
Upstream Slope	3.1 H to 1 V
Downstream Slope	3 H to 1 V

C. SERVICE SPILLWAY

Type	UNCONTROLLED EARTH SPILLWAY & RISE PIPE WITH PIPE THROUGH DAM
Crest Elevation	329 *
Control Section Length	100 feet
Capacity (Top of Dam)	1995 cfs

D. RESERVOIR

Type of Storage	<u>Elevation (MSL)</u>	<u>Storage Volume</u>
Normal Pool (Spillway Crest)	329 *	53 AC-FT
Maximum Pool (Top of Dam)	334.5 *	103 AC-FT

E. DRAINAGE BASIN

Drainage Area	0.5 sq. mi.
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* MSL Elevation Assumed from U.S.G.S. Topo Map.

SUMMARY OF ASSESSMENTS AND RECOMMENDATIONS
BIG LAKE DAM
ON A TRIBUTARY OF HATCHIE CREEK
HAYWOOD COUNTY
TENNESSEE

FEDERAL INVENTORY NUMBER TN 07505

The inspection of Big Lake Dam did not reveal any conditions that constitute an immediate hazard and it is presently considered safe. However, it is recommended that the following items be corrected and/or monitored:

1. The trees growing along the downstream slope should be removed.
2. The bushes along the water edge on the upstream slope should be removed.

The Fish and Wildlife Service has established the following categories to determine a priority ranking system for which work must be completed in order to maintain the integrity and operational adequacy of a dam structure:

1. Emergency Situation - The structure is in danger of imminent failure and action must be taken immediately to alleviate the emergency.
2. Priority 1 - Normal operation of the structure is impaired and the safety of the structure is in jeopardy. Funding should be provided within one year to correct the deficiencies.
3. Priority 2 - Consists mainly of observed maintenance deficiencies. These deficiencies should be corrected within three years.

Items 1 and 2 listed above are considered Priority 2 category items.

1. INTRODUCTION

1.1 General

- a. Authority. This inspection report was prepared in accordance with the Department of the Interior Manual, Part 753, Dam Safety Program, the Federal Guidelines for Dam Safety, and The Dam Inspection Act, Public Law 92-367.
- b. Purpose of Inspection. The purpose of this report is to present the findings of the Phase One Investigation under the National Program of Inspection of Federally Owned Dams.
- c. Scope of Report. This Phase One Investigation develops an assessment of the general condition of the project with respect to safety based on the available data and a visual inspection. This report also determines if there is a need for emergency measures, and if additional studies, investigations or analyses are required.
- d. Inspection Team. Inspection of Big Lake Dam was conducted the week of August 23, 1983. The team consisted of the following:

William C. McIntyre, P.E., USFWS,
Denver Engineering Center

Calvin Henry, Staff Specialist, USFWS,
Engineering, Region 6

1.2 Description of Project

- a. Location. Big Lake Dam is located at 35° 28' latitude and 89° 11' longitude in Haywood County, Tennessee. The dam is located approximately 4 miles east of the Hatchie National Wildlife Refuge Headquarters.
- b. Ownership. Big Lake Dam is owned and operated by the United States Department of the Interior, U.S. Fish and Wildlife Service.
- c. Purposes of Dam. The dam was built for wildlife purposes.

- d. Size and Hazard Potential Classification. Dams are classified as to height and storage capacity as follows:

<u>SIZE CLASS</u>	<u>STORAGE (AcFt)</u>	<u>HEIGHT (Ft)</u>
Small	< 1,000 BUT <u>≥</u> 50	< 40 BUT > 25
Intermediate	<u>≥</u> 1,000 BUT < 50,000	<u>≥</u> 40 BUT < 100
Large	<u>≥</u> 50,000	<u>≥</u> 100

The size classification is determined by either storage or height, whichever gives the larger size category.

Dams are further classified for potential hazard as follows:

<u>HAZARD CLASS</u>	<u>LOSS OF LIFE</u>	<u>ECONOMIC LOSS</u>
	Extent of Development	Extent of Development
Low	<u>NONE EXPECTED</u> No Permanent Structures for Human Habitation	<u>MINIMAL</u> Undeveloped or Occasional Structures Agricultural Use.
Significant	<u>FEW</u> No Urban Developments and No More than One Inhabitable Structure.	<u>APPRECIABLE</u> Notable Agriculture, Industry or Structures.
High	<u>MORE THAN ONE</u>	<u>EXCESSIVE</u> Extensive Common Industry or Agriculture.

Big Lake Dam is 19.0 feet high and has a storage capacity of 103 acre-feet, placing it in the small size class.

Structures located below the dam will not be affected by a clearweather breach of Big Lake Dam. The

economic loss would be minimal, placing it in the low hazard category.

- e. Basin Description. Big Lake Dam is located on a tributary of Hatchie Creek. Hatchie Creek is a tributary of the Mississippi River. The drainage area above Big Lake Dam is approximately 0.5 square miles. The longest water course above the lake is approximately 1.4 miles in length with an average gradient of approximately 65 feet per mile. The elevation in the basin ranges from approximately 330 at the upper end of the lake to 420 at the highest point.

2. DAM

- 2.1 Description. Big Lake Dam is a homogeneous earthfill structure with a crest length of approximately 1000 feet and crest width of approximately 16 feet, at elevation 334.5. The upstream slope is approximately 3.1 horizontal to 1 vertical and the downstream slope is approximately 3 horizontal to 1 vertical. The structural height is approximately 19 feet and has a hydraulic height of approximately 13.5 feet. See Figures C-1 and C-2 and Photos Numbers 1, 2, and 8.

- 2.2 Structure. There are no detailed drawings and specifications available for this structure. The design and construction appear to have been satisfactory.

- 2.3 Present Conditions.

- a. Upstream Face. The slope was only visible above the water surface which was approximately 1 foot below the normal pool level at the time of the inspection. The slope, above normal pool, is protected with a vegetative cover. Bushes growing along normal water line. There are no visible cracks or other evidence of slope instability. See Photos Number 1 and 2.
- b. Downstream Face. The slope is protected with a vegetative cover and shows no signs of erosion. A number of trees are located on the downstream slope near the outlet pipe. There are no visible cracks or other evidence of slope instability. There is no evidence of any burrowing in the embankment.

- c. Crest. The crest has a width of 16 feet and the crest elevation varies 1.5 feet from the right to left abutments. The top of the dam is used as a surfaced refuse road and the change in road grade causes the variation in the crest elevation of the dam. There are no visible cracks or other evidence of structural instability. See Photo Numbers 2 and 8.
- d. Drainage or Seepage Control. There is no drainage or seepage control in this structure.
- e. Instrumentation. There is no instrumentation in this structure.

2.4 Conclusions and Recommendations. The structure appears to be in good operating condition, but does show the lack of maintenance. The trees growing along the downstream slope should be removed. The bushes along the water surface adjacent to the upstream slope should be removed.

3. SPILLWAY

3.1 Description. The emergency spillway is earthen cut, approximately 100 feet wide, 3 feet deep, and located at the right abutment. The low level spillway is a 24-inch diameter riser with an 18-inch diameter conduit through the dam.

3.2 Investigation of Design and Appraisal of Design. There are no detailed drawings or specifications available.

- a. Discharge Capacity. The capacity of the spillway is approximately 1995 cfs before the dam is overtopped. See Figure D-2 for discharge curve.
- b. Hydraulic Design. The capacity of the spillway was calculated using the weir and orifice equations. The Federal Guidelines for Dam Safety recommends that the spillway shall pass a minimum SDF (spillway design flood) of 50 year magnitude. The SDF produces a maximum reservoir water surface elevation to 3.5 foot below the top of the dam.
- c. Structural Design. There are no structural components associated with the Big Lake Dam.

d. Mechanical and Electrical Design. There are no mechanical or electrical components.

3.3 Description and Appraisal of Construction. There are no detailed drawings and specifications for this structure.

3.4 Present Structural Conditions and Hydraulic Performance.

a. Approach Channel. There is no approach channel for the low level spillway. The emergency spillway is a grass lined earth channel.

b. Control Structure. The control for the low level spillway is a 24-inch diameter riser pipe with slide gate and the control for the emergency spillway is a weir section where the flow passes through critical depth.

c. Conveyance Channel. The low level conveyance channel is composed of one 18-inch diameter CMP conduit through the dam. The emergency conveyance channel is a grass lined earth channel.

d. Terminal Structure. There are no terminal structures constructed at Big Lake Dam. The flow discharges back into the natural stream channel. There is no sign of serious erosion occurring.

3.5 Conclusion and Recommendation. The design is considered adequate since the spillway will pass the SDF with 3.5 foot of freeboard. The spillway appears to be operating satisfactorily.

4. OUTLET WORKS

4.1 Description. The outlet is the same structure as the low level spillway. The maximum outlet capacity is approximately 10 cfs. See Photos Numbers 3, 4, 5, 6 and 7.

4.2 Investigation and Appraisal of Design

a. Emergency Withdrawal Capacity. During periods of very low or no flow, which is the case for most of the year, the reservoir can be drained in

approximately 6 days. With an inflow of 10 cfs, the reservoir cannot be drained. The outlet is considered adequate to drain the reservoir except during short periods of heavy run-off.

b. Structural Design. There are no drawings or specifications for the outlet structure.

c. Mechanical and Electrical Design. There is no mechanical or electrical equipment.

5. SITE GEOLOGY AND REGIONAL SEISMICITY.

5.1 Description of Site Geology. Big Lake Dam is located in the North Central Plateau region of the Coastal Plain Province with medium permeable, silty soils.

5.2 Regional Seismicity. Big Lake Dam is located in seismic zone 3 which is classed as causing major damage to structures.

6. FOUNDATION

6.1 Description. There are no details or specifications for this structure.

6.2 Performance. There are no signs of failure in the foundation.

6.3 Conclusions and Recommendations. No conditions were noted during the inspection to indicate any problems with the foundation.

7. RESERVOIR

7.1 Description. The reservoir has a maximum width of approximately 0.1 of a mile and a length of approximately 0.2 of a mile with a storage capacity of approximately 51 acre-feet at spillway crest elevation 329.

7.2 Potential for Producing Spillway-Obstructing Debris. The stream channel above the reservoir is wooded, which could be washed out during periods of very high run-off.

7.3 Sedimentation. The area above the reservoir is well vegetated, so very little sediment will be produced.

7.4 Upstream Conditions. The area above the reservoir is forest and range land and there are no planned changes in its use.

7.5 Conclusions and Recommendations. No conditions were noted during the inspection to indicate any problems with the reservoir.

8. DOWNSTREAM CHANNEL

8.1 Main Channel. The main channel below this dam varies in width from 200 - 500 feet with an average slope of approximately 2 feet per mile. The main channel is wooded for most of its length.

8.2 Structure. There are no structures downstream of Big Lake Dam.

9. HYDROLOGY-HYDRAULICS

9.1 Inflow Flow. The drainage area for Big Lake Dam was outlined on U.S. Geological Survey's 7-1/2 minute quadrangle maps. See Figure D-1. The drainage area above the dam is 0.5 square miles.

Big Lake Dam is classified as a small low hazard dam and the Federal Guidelines recommend that the minimum SDF (Spillway Design Flood) be of a 50 year magnitude.

The 50-year 24-hour rainfall was obtained from depth-area-duration curves contained in TP-40, National Weather Service (NWS). The 24-hour rainfall for 0.5 square mile drainage area is 6.9 inches. Precipitation was distributed according to Corps of Engineers (COE) Engineering Manual Number 1110-2-1411 and modified by using an initial loss of 1.6 inches.

A hydrograph was developed using the COE, HEC1N Program, and Soil Conservation Service coefficients. The SDF had a peak inflow of approximately 229 cfs. See Table D-1.

9.2 Overtopping Potential. SDF will pass through the spillway with approximately 3.5 feet of freeboard.

- 9.3 Inundation Studies. A breach of Big Lake Dam will cause flooding downstream; however, no damage will occur to any other refuge property.
- 9.4 Conclusions and Recommendations. The spillway will pass the minimum SDF with approximately 3.5 feet of free board.
10. PROJECT ACCESS
- 10.1 Description of Site Access. Access to the dam is by a surfaced refuge road which should remain open under most weather conditions.
- 10.2 Spillway and Outlet Access. From the top of the dam by a wood access structure.
- 10.3 Present Condition. The access road is in good condition. During periods of high water the wood access structure will be submerged.
11. PROJECT OPERATION AND MAINTENANCE
- 11.1 Responsibility. U.S. Fish and Wildlife Service is responsible for operation and maintenance.
- 11.2 Operating Criteria. Water management on the refuge is primarily for wildlife.
- 11.3 Maintenance. Refuge staff are responsible for normal maintenance.
- 11.4 Instrumentation. There is no instrumentation installed on this structure.
- 11.5 Vegetation Control. There is no vegetation control.
- 11.6 Communications. Communication at the dam site consists of radio equipped vehicles, with a radio base station and telephones at the Refuge Headquarters.
- 11.7 Emergency Procedures. There is no contingency plan for Dam Safety Emergencies.

- 11.8 Conclusions and Recommendations. Operations and maintenance is accomplished by the U.S. Fish and Wildlife Service personnel. It is recommended that a contingency plan be prepared.

APPENDIX A

FIELD INSPECTION

CHECK LIST

PHASE 1

INSPECTION CHECKLIST

NAME OF DAM: BIG LAKE DAM
 STATE: TENNESSEE
 COUNTY: HAYWOOD
 INVENTORY NO.: TN 07505
 HAZARD CATEGORY: 3 (LOW)
 TYPE OF DAM: EARTHFILL

OWNER: US FISH & WILDLIFE SERVICE
 INSPECTED BY: MCINTYRE/HENRY
 DATE INSPECTED: AUGUST 23, 1983
 WEATHER: HOT
 TEMPERATURE: 95 0 +
 POOL ELEVATION: 1 FOOT BELOW SPILLWAY
 CREST
 TAILWATER ELEVATION: NO TAIL WATER

DIRECTIONS: MARK AN "X" IN THE YES OR NO COLUMN. IF AN ITEM DOES NOT APPLY, WRITE "NA" IN THE REMARKS COLUMN.

ITEM	YES	NO	REMARKS
DAM			
1. UPSTREAM SLOPE			
a. Adequate grass cover	X		GRASSES/SMALL BUSHES
b. Any erosion		X	
c. Are trees growing on slope		X	
d. Longitudinal cracks		X	
e. Transverse cracks		X	
f. Adequate riprap protection			NONE
g. Any stone deterioration		X	
h. Visual depressions or bulges		X	
i. Visual settlements		X	
j. Burrows			
2. DOWNSTREAM SLOPE			
a. Adequate grass cover	X		
b. Any erosion		X	
c. Are trees growing on slope	X		NEAR OUTLET PIPE
d. Longitudinal cracks		X	
e. Transverse cracks		X	
f. Visual depressions or bulges		X	
g. Visual settlements		X	
h. Burrows			
3. CREST			
a. Any visual settlements		X	
b. Misalignment		X	
c. Cracking		X	
4. DRAINAGE OR SEEPAGE CONTROL			
a. Is the toe drain dry			N/A
b. Are the relief wells flowing			
c. Are boils present			
d. Is seepage present			

ITEM	YES	NO	REMARKS
5. ABUTMENTS			
a. Any erosion		X	
b. Visual differential movement		X	
c. Any cracks noted		X	
d. Is seepage present		X	
e. Any slides		X	
SPILLWAY			
1. APPROACH CHANNEL			
a. Eroding or backcutting		X	
b. Sloughing		X	
c. Restricted by vegetation		X	
d. Obstructed with debris		X	
e. Silted in		X	
f. Log boom in place			N/A
2. INLET CONTROL STRUCTURE			
a. Does concrete show:			RISER PIPE W/ CHANNEL
1. Spalling			GATE 18" CMP
2. Cracking			
3. Erosion			
4. Scaling			
5. Exposed reinforcement			
b. Do joints show:			
1. Displacement or offset			
2. Loss of joint material			
3. Leakage			
c. Is spillway earth cut			
1. Are slopes eroding		X	
2. Are slopes sloughing		X	
3. Is crest eroding		X	
d. If controlled spillway			
1. Are gates bent/broken			
2. Are they corroded/rusted			
3. Are controls, hoists, etc.			
in good order			
4. Periodically maintained			
5. Operational			
6. Date last operated			
7. When closed, do they leak			
e. Is weir in good condition			
f. Is control at the weir			

ITEM	YES	NO	REMARKS
3. CONVEYANCE STRUCTURE			
a. Is it concrete			
b. Do concrete surfaces show:			
1. Spalling			
2. Cracking			
3. Erosion			
4. Scaling			
5. Exposed reinforcement			
c. Do joints show:			
1. Displacement or offset			
2. Loss of joint material			
3. Leakage			
d. Is it an unlined channel	X		
e. Does channel show erosion		X	
f. Side slopes show sloughing		X	
g. Channel protected with vegetation/riprap	X		
4. TERMINAL STRUCTURE			
a. Do concrete surfaces show:			
1. Spalling			
2. Cracking			
3. Erosion			
4. Scaling			
5. Exposed reinforcement			
b. Do joints show:			
1. Displacement			
2. Loss of joint material			
3. Leakage			
c. Do energy dissipators show:			
1. Signs of deterioration			
2. Are they covered w/debris			
3. Signs of inadequacy			
5. OUTLET CHANNEL			
a. Is the channel:			
1. Eroding or backcutting		X	
2. Sloughing		X	
3. Obstructed	X		W/ TREES
4. Adequately riprapped			N/A

ITEM	YES	NO	REMARKS
OUTLET WORKS			
1. APPROACH CHANNEL			
a. Eroding or backcut			
b. Sloughing			
c. Restricted by vegetation			
d. Obstructed with debris			
e. Silted in			
f. Log boom in place			
2. INTAKE STRUCTURE			
a. Do concrete surfaces show:			
1. Spalling			
2. Cracking			
3. Erosion			
4. Scaling			
5. Exposed reinforcement			
b. Do joints show:			
1. Displacement or offset			
2. Loss of joint material			
3. Leakage			
c. Metal Appurtenances			
1. Corrosion present			
2. Breakage present			
3. Anchor system secure			
d. Unobstructed by silt & debris			
3. CONVEYANCE STRUCTURE			
a. Is it concrete			
b. Do concrete surfaces show:			
1. Spalling			
2. Cracking			
3. Erosion			
4. Scaling			
5. Exposed reinforcement			
c. Do joints show:			
1. Displacement or offset			
2. Loss of joint material			
3. Leakage			
d. Is the conduit metal	X		
e. Is corrosion present		X	
f. Protective coating adequate	X		
g. Is the conduit misaligned		X	
			CUTS DIAGONNALLY ACROSS FACE OF DAM

ITEM	YES	NO	REMARKS
4. CONTROL STRUCTURE			
a. Are there service gates	X		-1 CHANNEL GATE
b. Emergency gates/stop logs		X	
c. Are there control valves		X	
d. Are they bent/broken		X	
e. Are they corroded/rusted		X	
f. Periodically maintained			
g. Operational			
h. When closed, do they leak			
i. Date last operated			
j. Is there a low level outlet			
k. Is the low level outlet operational			
5. TERMINAL STRUCTURE			
a. Do concrete surfaces show:			
1. Spalling			
2. Cracking			
3. Erosion			
4. Scaling			
5. Exposed reinforcement			
b. Do joints show:			
1. Displacement			
2. Loss of joint material			
3. Leakage			
c. Do the energy dissipators:			
1. Show signs of deterioration			
2. Covered with debris			
3. Show signs of inadequacy			
6. OUTLET CHANNEL			
a. Is the channel:			
1. Eroding or backcutting			
2. Sloughing			
3. Obstructed			
4. Adequately riprapped			
RESERVOIR AREA			
a. Slides in reservoir area		X	
b. Debris producing areas in watershed		X	
c. Sediment producing areas in watershed		X	
d. Depressions, sinkholes or vortices in reservoir area		X	
e. Low ridges/saddles allowing overflow from reservoir			
f. Structures below elevation of maximum surcharge storage			

APPENDIX B

PHOTOGRAPHS

APPENDIX C

STRUCTURE DRAWINGS

APPENDIX D

HYDROLOGY & HYDRAULICS

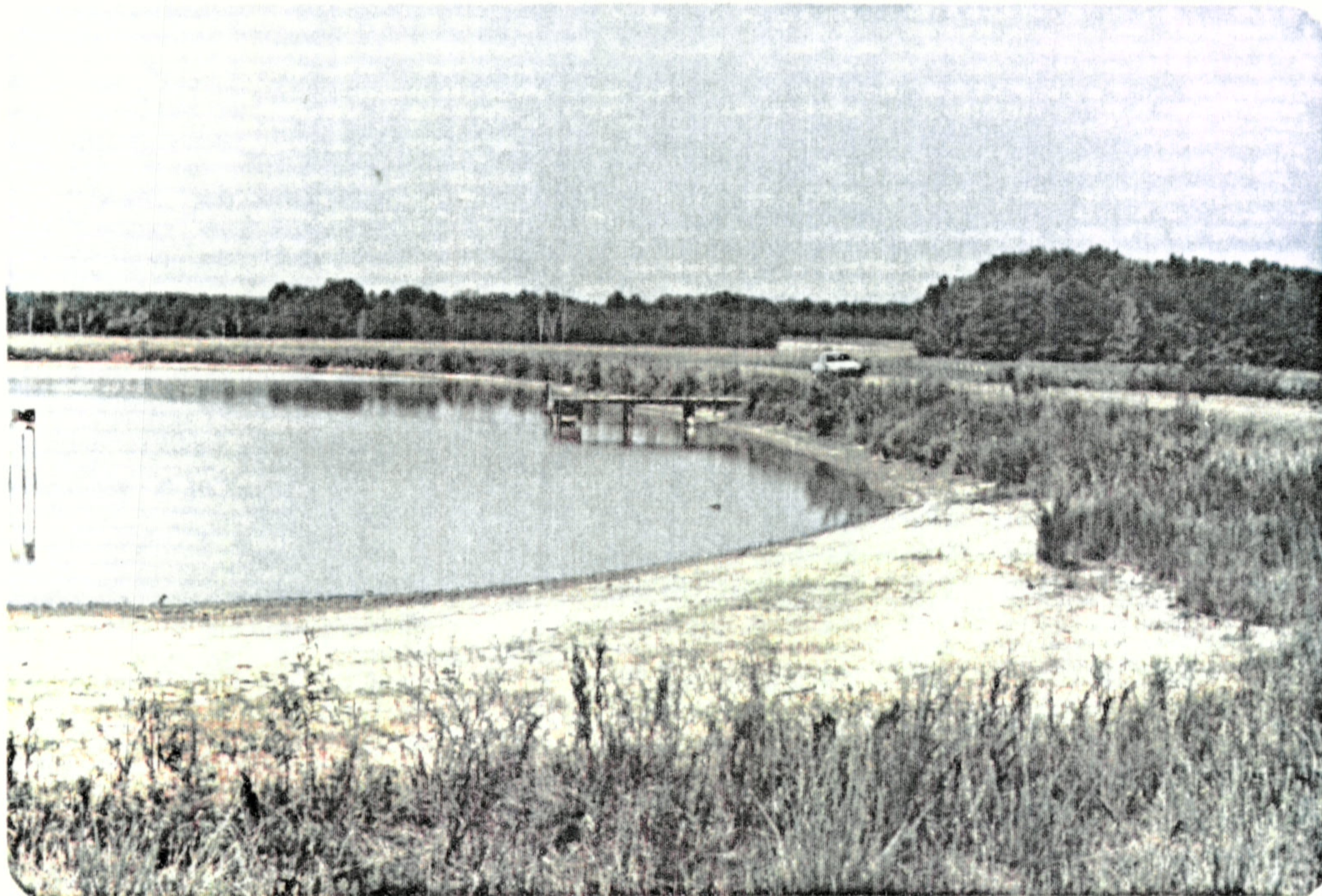
INFLOW HYDROGRAPH FOR SDF
TIME IN HOURS, FLOW IN CUBIC FEET PER SECOND

<u>TIME</u>	<u>FLOW</u>	<u>TIME</u>	<u>FLOW</u>	<u>TIME</u>	<u>FLOW</u>	<u>TIME</u>	<u>FLOW</u>
0.00	0	6.25	0	12.50	132	18.75	26
0.25	0	6.50	0	12.75	196	19.00	24
0.50	0	6.75	0	13.00	229	19.25	23
0.75	0	7.00	0	13.25	220	19.50	22
1.00	0	7.25	0	13.50	187	19.75	21
1.25	0	7.50	0	13.75	149	20.00	20
1.50	0	7.75	0	14.00	120	20.25	20
1.75	0	8.00	0	14.25	101	20.50	19
2.00	0	8.25	0	14.50	86	20.75	18
2.25	0	8.50	0	14.75	75	21.00	18
2.50	0	8.75	0	15.00	67	21.25	18
2.75	0	9.00	0	15.25	60	21.50	17
3.00	0	9.25	0	15.50	55	21.75	17
3.25	0	9.50	0	15.75	50	22.00	17
3.50	0	9.75	0	16.00	46	22.25	16
3.75	0	10.00	0	16.25	42	22.50	16
4.00	0	10.25	0	16.50	39	22.75	16
4.25	0	10.50	0	16.75	37	23.00	15
4.50	0	10.75	0	17.00	35	23.25	15
4.75	0	11.00	0	17.25	33	23.50	15
5.00	0	11.25	0	17.50	32	23.75	15
5.25	0	11.50	1	17.75	31	24.00	14
5.50	0	11.75	6	18.00	30	24.25	14
5.75	0	12.00	26	18.25	29	24.50	12
6.00	0	12.25	68	18.50	27	24.75	9

TABLE D-1

BIG LAKE DAM

HATCHIE NATIONAL WILDLIFE REFUGE



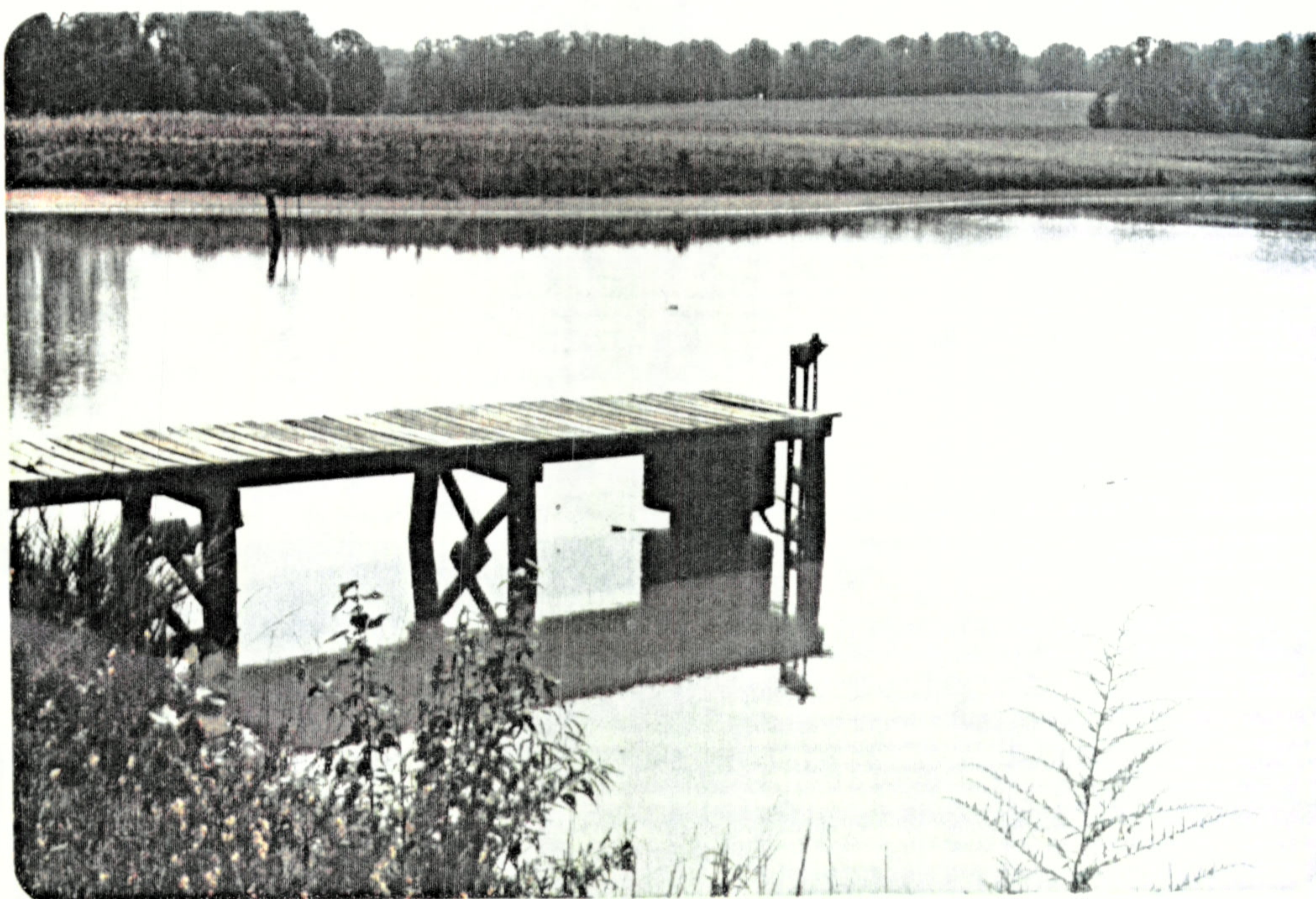
1. UPSTREAM SLOPE AND OUTLET WORKS LOOKING WEST



2. VIEW EAST OR UPSTREAM SLOPE CREST



3. OUTLET STRUCTURE LOOKING WEST



4. OUTLET WORKS LOOKING EAST



5. IMPOUNDMENT AREA



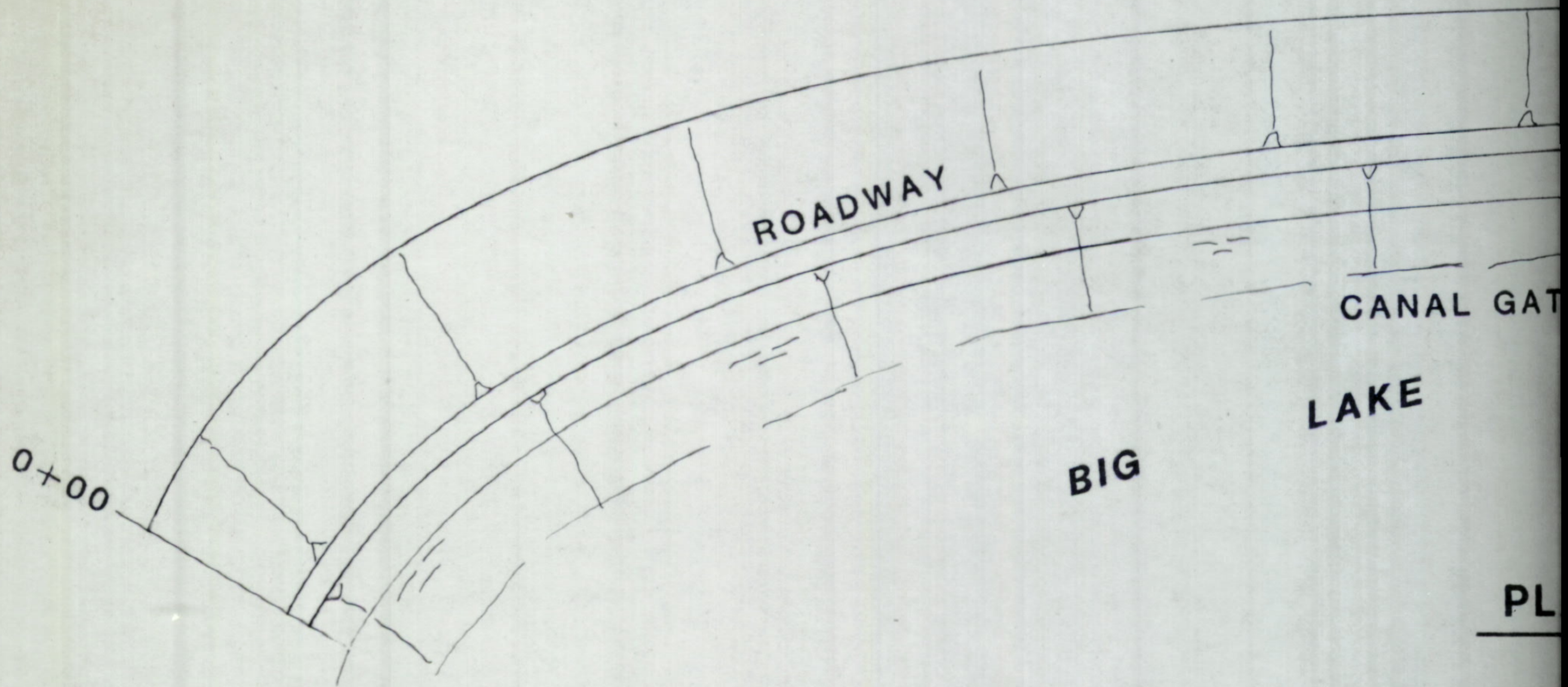
6. IMPOUNDMENT AREA



7. IMPOUNDMENT AREA



8. VIEW OF SPILLWAY



340

330

320

310

INLE

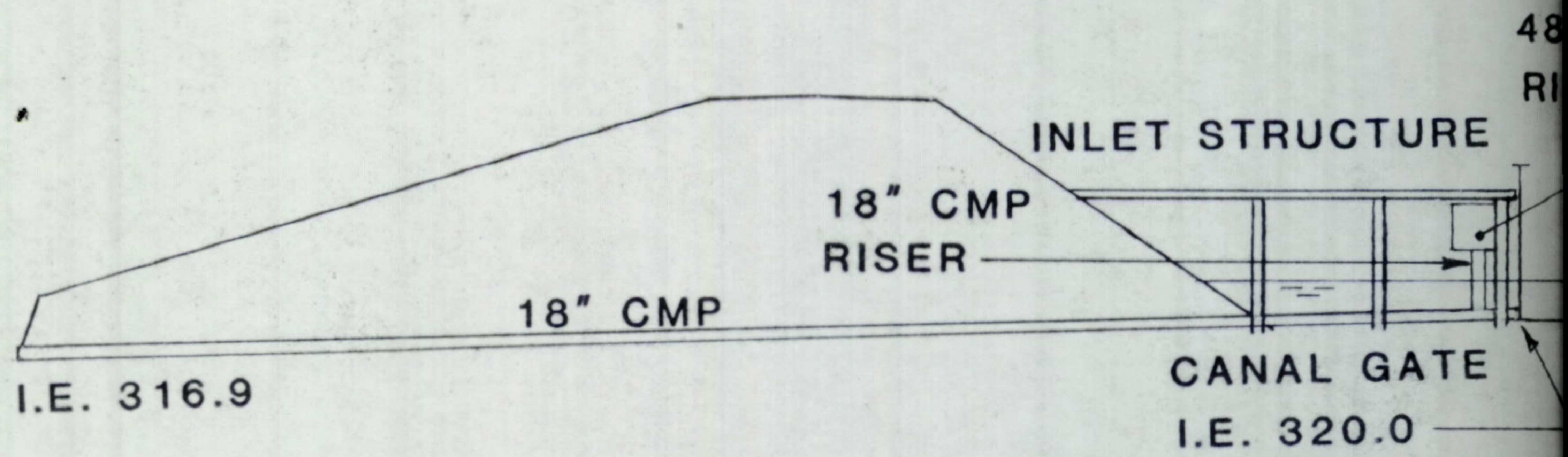
UPSTREAM

340

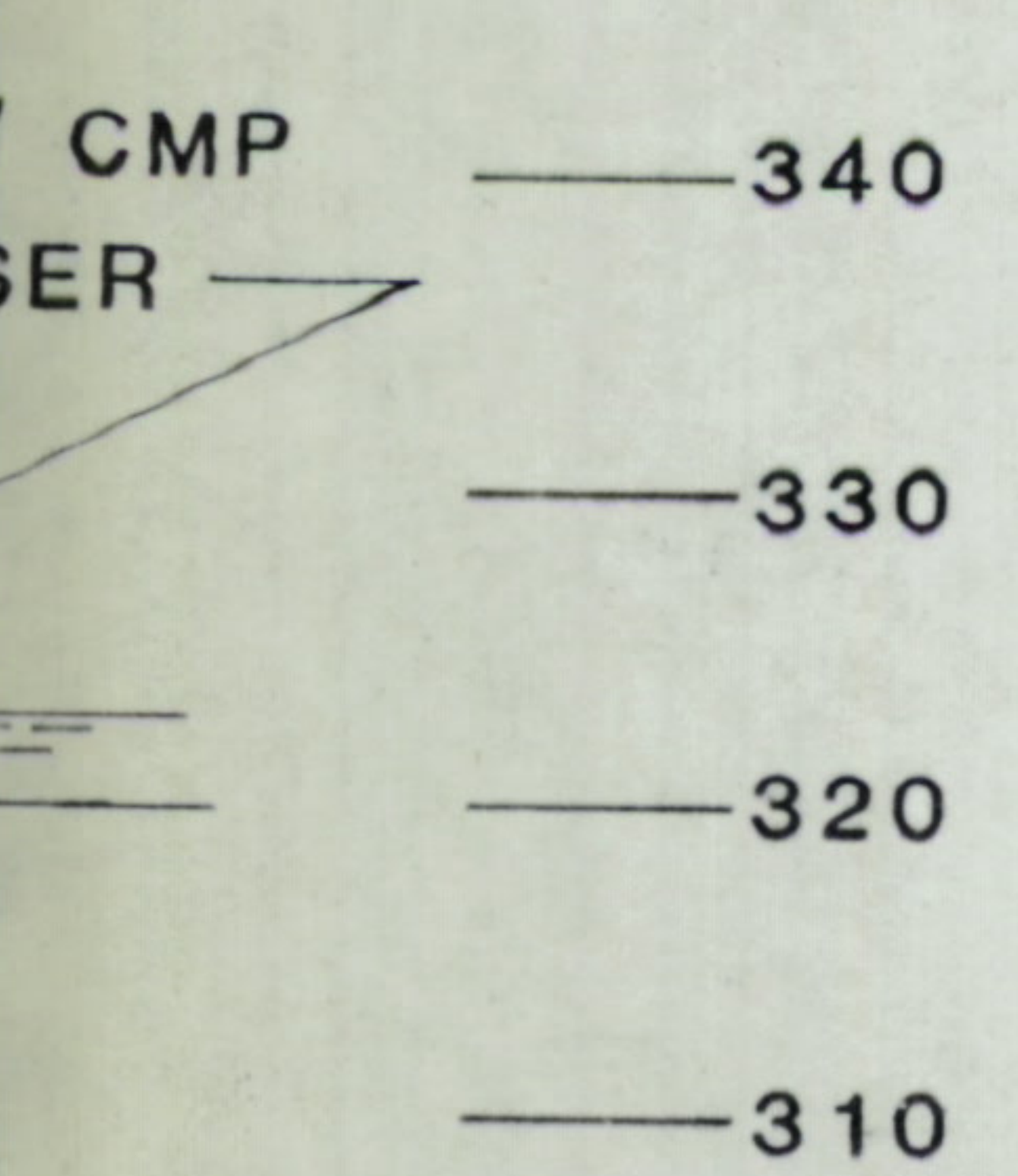
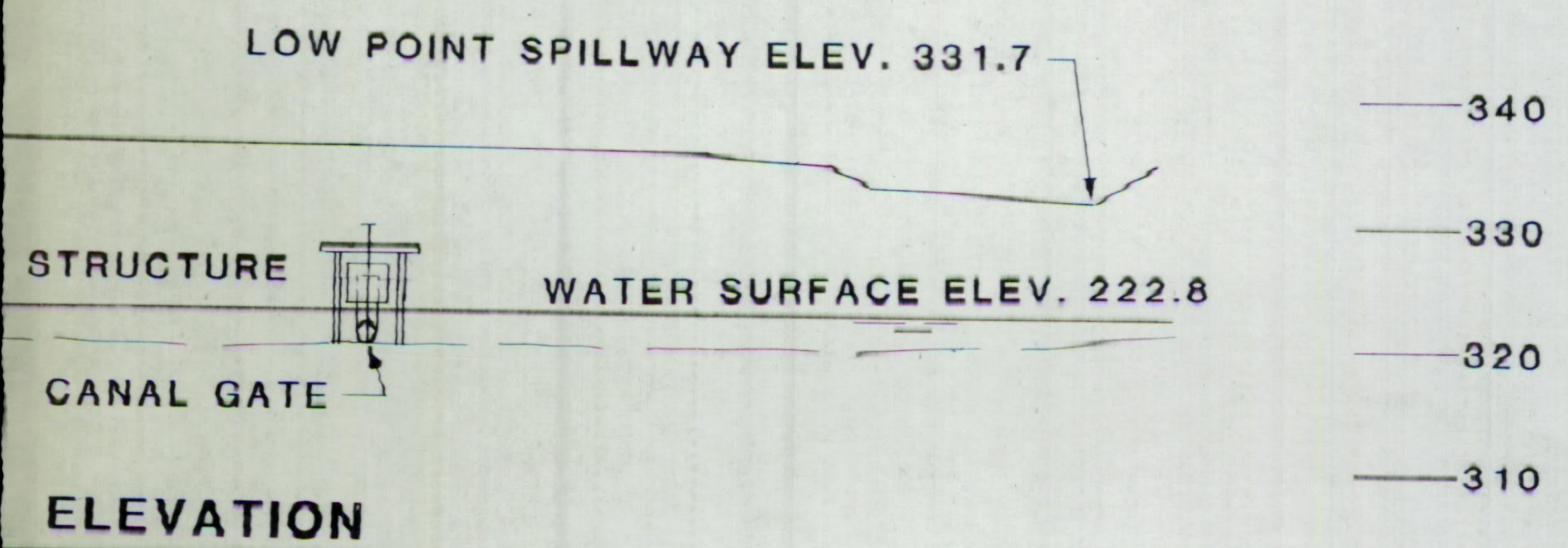
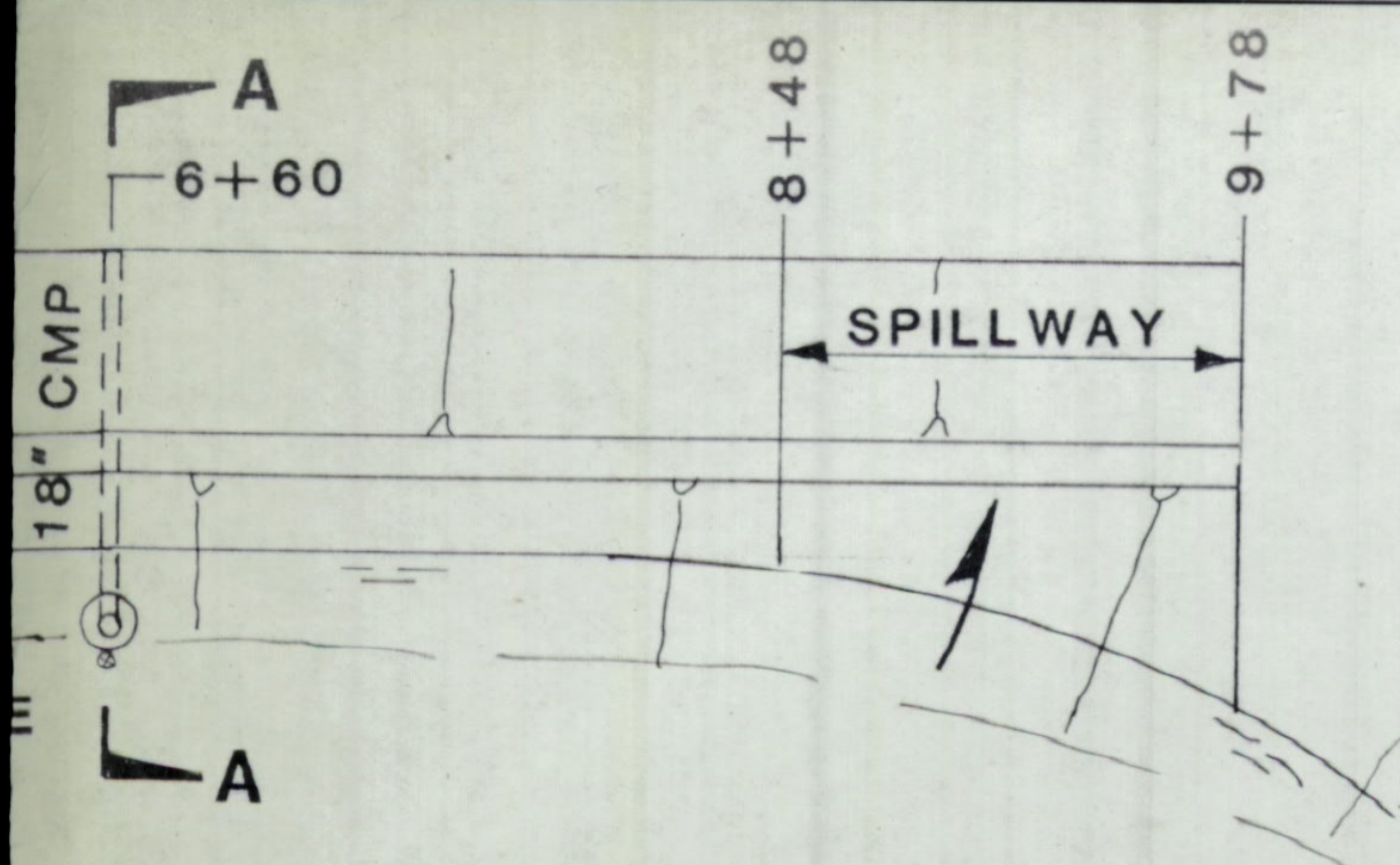
330

320

310



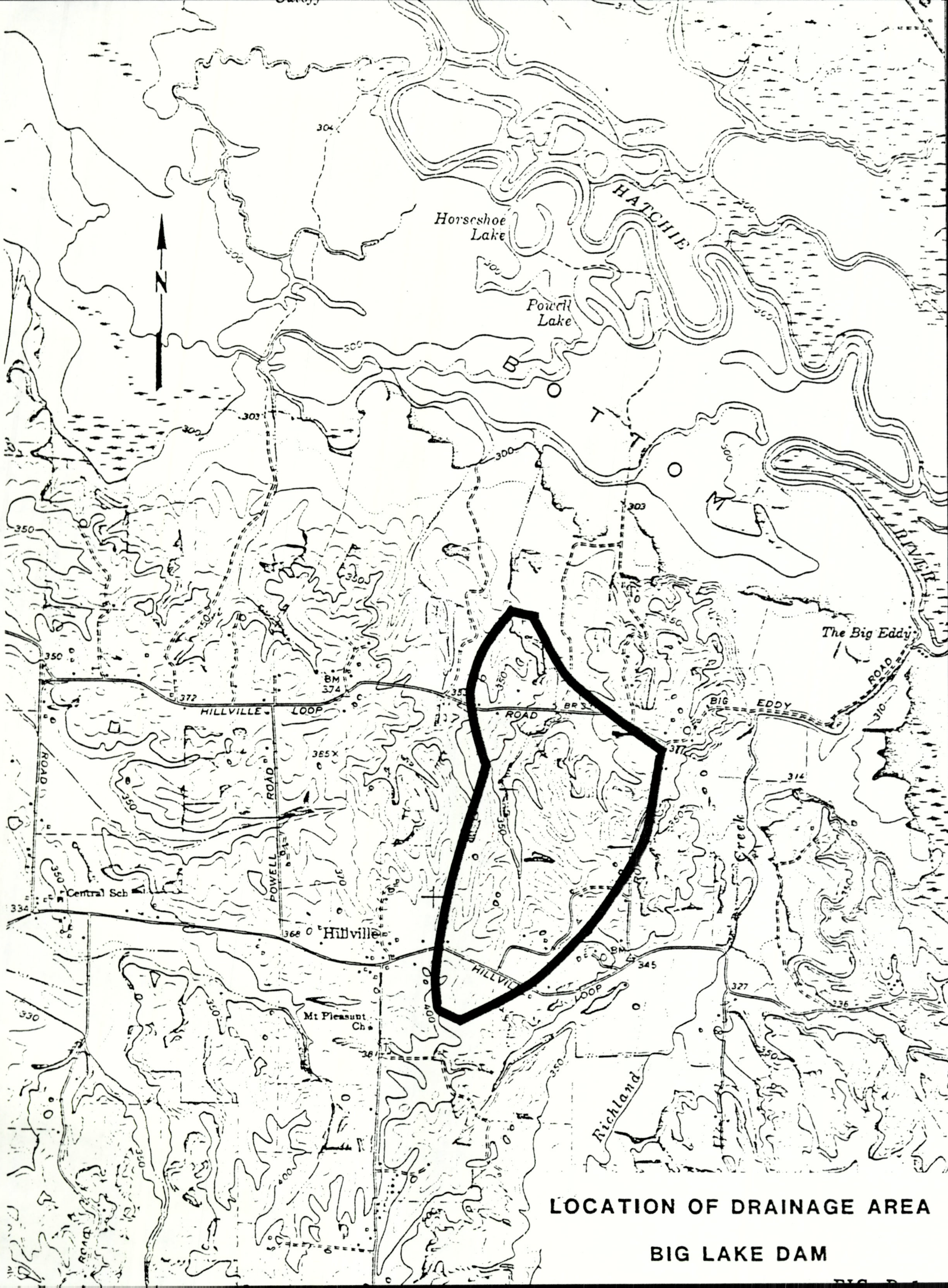
SECTION A-A



PLAN, ELEVATION & SECTION
BIG LAKE
HATCHIE
NATIONAL WILDLIFE REFUGE

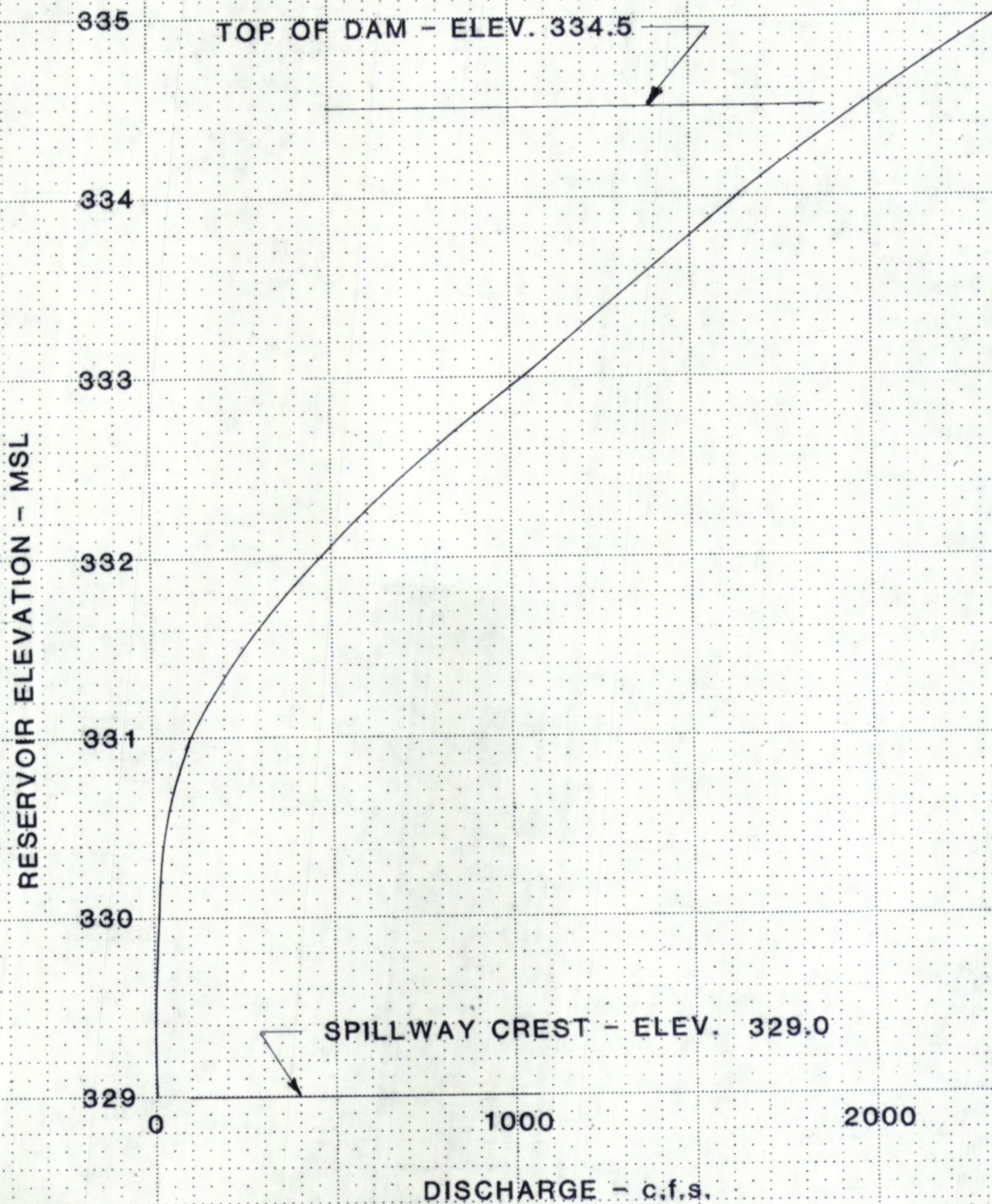
NOT TO SCALE

FIG.C-1



LOCATION OF DRAINAGE AREA

BIG LAKE DAM



**SPILLWAY RATING CURVE
BIG LAKE DAM
HATCHIE
NATIONAL WILDLIFE REFUGE**